

इंटरनेट

मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 12379 (1988): Code of practice for lining of water-courses and field channels [WRD 13: Canals and Cross Drainage Works]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE



Indian Standard

**CODE OF PRACTICE FOR
LINING OF WATER-COURSES AND
FIELD CHANNELS**

(First Reprint JANUARY 1996)

UDC 626.823.19

© *Copyright* 1988

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BHADUR SHAH ZAFAR MARG
NEW DELHI 110002

AMENDMENT NO. 1 AUGUST 2005
TO
IS 12379 : 1988 CODE OF PRACTICE FOR
LINING OF WATER-COURSES AND FIELD CHANNELS

(Page 1, clause 2) — Add a new clause 2 as given below:

2 REFERENCES

2.1 The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
IS 2 : 1960	Rules for rounding off numerical values (<i>revised</i>)
IS 269 : 1989	Specification for 33 grade ordinary Portland cement (<i>fourth revision</i>)
IS 383 : 1999	Specification for coarse and fine aggregates from natural sources for concrete (<i>third revision</i>)
IS 456 : 2000	Code of practice for plain and reinforced concrete (<i>fourth revision</i>)
IS 712 : 1984	Specification for building limes (<i>third revision</i>)
IS 1077 : 1992	Common burnt clay building bricks — Specification (<i>fifth revision</i>)
IS 1489 (Part 1) : 1991	Specification for Portland pozzolana cement : Part 1 Flyash based (<i>third revision</i>)
IS 1489 (Part 2) : 1991	Specification for Portland pozzolana cement : Part 2 Calcined clay based (<i>third revision</i>)
IS 1542 : 1992	Specification for sand for plaster (<i>second revision</i>)
IS 2116 : 1980	Specification for sand for masonry mortars (<i>first revision</i>)
IS 2250 : 1981	Code of practice for preparation and use of masonry mortar (<i>first revision</i>)

Amend No. 1 to IS 12379 : 1988

<i>IS No.</i>	<i>Title</i>
IS 4701 : 1982	Code of practice for earthwork on canals (<i>first revision</i>)
IS 7969 : 1975	Safety code for handling and storage of building materials
IS 9698 : 1995	Code of practice for lining of canals with polyethylene film (<i>first revision</i>)
IS 12894 : 2002	Pulverized fuel ash — Lime bricks — Specification (<i>first revision</i>)
IS 10430 : 2000	Criteria for design of lined canals and guidance for selection of type of lining (<i>first revision</i>)
IS 10646 : 1991	Specification for canal linings — Cement concrete tiles (<i>first revision</i>)
IS 13757 : 1993	Specification for burnt clay flyash building bricks

2.2 Whenever cross references to the above standards appear in the text of the standard, the above-clause shall apply.

(Page 2, clause 3.1) — Substitute the following for the existing clause:

'3.1 Cement — Cement used in the preparation of masonry mortar or cement concrete shall conform to either IS 269, IS 1489 (Part 1), IS 1489 (Part 2) as specified by the engineer-in-charge.'

(Page 2, clause 3.4) — Substitute 'IS 456' for 'IS : 456 - 1978'.

(Page 2, clause 3.6) — Substitute the following for the existing clause:

'3.6 Bricks — Bricks shall be in accordance with IS 1077 or IS 12894 or IS 13757.'

(Page 4, clause 4.6) — Substitute 'IS 10646' for 'IS : 10646-1983*'.

General : Delete Notations and relevant footnotes pertaining to Indian Standards and their title and year of publication, wherever occurring in the standard.

(WRD 13)

Indian Standard

CODE OF PRACTICE FOR LINING OF WATER-COURSES AND FIELD CHANNELS

0. FOREWORD

0.1 This Indian Standard was adopted by the Bureau of Indian Standards on 31 May 1988, after the draft finalized by the Canals and Canal Lining Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Lining of water-courses not only minimizes the loss of water due to seepage, but also results in achieving considerable economy in land use due to reduction in cross-section of water-courses. Water thus saved may be usefully utilized for extension and improvement of irrigation facilities. Besides, in case of unlined water-courses, there is gradually rise in water table, thereby rendering the tract prone to water logging. Lining ensures stability, rigidity and easy maintenance of water-course at lesser cost. The flatter bed slopes may be achieved which improves the command and eliminates the necessity of *JHALLARS* (water lifting device). In most cases gravity command becomes available. The filling time of water-courses takes less time and velocity of water is more. There is more equitable distribution of water, and better regulation and management.

PUCCA NAKKAS (openings) eliminates the cause of accidental or intentional breaches. It is an entirely new concept of water management and discipline.

0.2.1 Proper selection of serviceable and economical lining at first instance and proper execution of lining work reflects considerably in achieving overall economy on the project. Guidelines with regard to the selection of canal lining for any particular canal/water-course shall be in accordance with IS : 10430-1982*.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Criteria for design of lined canals and guidelines for selection of type of lining.

†Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard covers the lining of water-courses and field channels in brick/tile, stone slab/stone masonry, cement concrete, pre-cast concrete slabs and LDPE film along with rigid cover.

2. GENERAL

2.1 The shape of the lined water-course may generally be rectangular, trapezoidal or semi-circular shape. Following are the types of lining:

- a) Brick/tile lining,
- b) Composite cement concrete and brick masonry lining,
- c) Cement concrete *in-situ*/pre-cast lining,
- d) Stone slab/stone masonry lining, and
- e) LDPE film with rigid cover.

2.2.1 *Earthwork in Non-Compaction Zone* — It shall be free from shrubs, clods and shall be laid in 150 mm thick layers. Measurements shall be made as in the case of filling and 10 percent deductions may be allowed from actual measured cubical contents. The outer side slope shall depend upon the type soil and height of the fill.

2.2 *Compaction of Earthwork Under Bed* — Earthwork shall be laid under the bed in 75 mm thick layers and compacted with steel tampers or by other mechanical means at optimum moisture content.

NOTE — This type of earthwork shall be applicable for fill at the back of vertical wall only. For other sections, the earthwork shall be in accordance with IS : 4701 - 1982*.

2.3 *Soil Survey* — It is to know the type of soil moisture content and dry density attainable along the entire length of water-course or earthen channel.

2.4 *Lip Cutting* — After the compacton, the water-courses/field channels are cut to the final section by removing the extra soil from the bed and from the inner slopes of the banks.

2.5 *Alignment and Layout* — Construction bench marks shall be provided at an interval of 100 m with double levelling. The centre line of the water-course/field channel to be marked on pegs at an interval of 6 to 10 m apart longitudinally and shall be so fixed that their tops indicate the correct bottom level of the bed lining.

*Code of practice for earthwork on canals (*first revision*).

2.6 Slope — The bed slope of the lined section of the water-course to be adopted is fixed with regard to the designed full supply level at the head of the water-course, the critical level of the field⁹ to be irrigated from the water-courses or the branch under consideration subject to the minimum limit of slope of 1.5 cm/100 m length, as far as possible. The permissible tolerance for finished bed level of water-course shall not be more than 1 cm as compared to the designed level.

2.7 In case of problematic soils, suitable engineering measures shall be taken.

2.8 Free Board — 7.5 cm of free board shall be provided above the calculated full supply level.

2.9 Sub-Grade — The surface over which lining is to rest is called sub-grade. It is to be perfectly true in profile in accordance with the cross-section of the water-course so as to form a firm compacted bed for the lining.

2.10 Consistency — Consistency of cement mortar shall be in accordance with IS : 2250 - 1981*.

2.11 Setting — Setting of cement mortar shall be in accordance with IS : 2250-1981*.

2.12 Water Retentivity of Mortar — It shall be in accordance with IS : 2250-1981*.

2.13 Workability — Workability of cement mortar/cement concrete shall be in accordance with IS : 456-1978† or IS : 2250-1981*.

3. MATERIALS

3.1 Cement — Cement used in the preparation of masonry mortar or cement concrete shall conform to either IS : 269-1976† or IS : 455-1976§. IS : 1489-1976|| or IS : 3466-1967¶.

3.2 Aggregate

3.2.1 Fine Aggregate — Sand shall conform to IS : 2116-1980**, IS : 383-1970†† or IS : 1542-1977‡‡.

3.2.2 Coarse Aggregate — It shall conform to IS : 383-1970††.

*Code of practice for preparation and use of masonry mortars (first revision).

†Code of practice for plain and reinforced concrete (third revision).

‡Specification for ordinary and low heat Portland cement (third revision).

§Specification for Portland slag cement (third revision).

||Specification for Portland-pozzolana cement (second revision).

¶Specification for masonry cement (first revision).

**Specification for sand for masonry mortars (first revision).

††Specification for coarse and fine aggregates from natural sources for concrete (second revision).

‡‡Specification for sand for plaster (first revision).

3.3 Stone — Stone for stone masonry lining shall be sound, hard and durable so that it shall be able to sustain weathering and water action. It shall be free from laminations, soft spots, cracks, seams and other defects. The stone shall be laid with their smooth surface on top. The dimensions of the stone shall be such that there are minimum number of joints.

3.4 Water — Water used in masonry work, making concrete, mortar bricks or for other plain or reinforced general construction shall be clear and free from objectionable quantities of deleterious materials and shall conform to IS : 456-1978*.

3.5 Storage of Materials — It shall be in accordance with IS : 7969-1975†.

3.6 Bricks — It shall be in accordance with IS : 1077-1986‡.

3.7 Lime — It shall conform to IS : 712-1984§.

4. PROCEDURE FOR LINING

4.1 Earthwork

4.1.1 Excavation — The centre line shall first be pegged out and marked with *DAGH BEL* or dimension lines as per designed L-section of channel. All curves shall be properly laid down and the lines indicating the top of the cutting or the toe of the embankments shall then be set out. These lines shall be ascertained from the X-section of the existing ground work and finished work. Reference pegs shall also be driven into the ground.

4.1.1.1 Before commencing construction work, complete profiles of the compacted portion of the bed and embankments indicating finished section shall be set up at 150 metres apart or at such intervals as required due to the physical condition. These profiles shall be 3 metres in length along the alignment. Ends of the profile banks shall be stepped so that proper bond shall be achieved with earthfill laid afterwards. When the side slope in existing surface is more than 1:4, the ground shall be trenched or stepped to have solid embankments. Manual excavation in cutting for channels shall be carried out in 610 to 1 525 mm lifts. Special precautions shall be taken to ensure that excavation may be drained properly to prevent accumulation of water or formation of rain cuts. No excavated material shall be placed within 900 mm from the edge of any trench. All gangways, paths and steps shall be kept within

*Code of practice for plain and reinforced concrete (third revision).

†Safety code for handling and storage of building materials.

‡Specification for common burnt clay building bricks (fourth revision).

§Specification for building limes (third revision).

the section so that their removal in the end leaves the section true to design. In case of deep excavations, proper shuttering shall be done to avoid collapsing of trench.

4.1.1.2 Borrow pits shall be used for obtaining soils for earthfills only where absolutely unavoidable. No borrow pits shall be dug within 5 metres of the final section of the embankments, after making due allowance for future development. All borrow pits shall be dug to maximum depth of 300 mm only.

4.1.1.3 All mud, slush and decay or other vegetation shall be excluded from the filling and clods of broken earth. The filling shall be placed in continuous horizontal layers of 75 mm thickness for hand compaction. Water shall be sprinkled on each layer and thoroughly rammed before the next one is laid. Filling shall be started from the outer edges working towards the centre in slightly concave layers and dressed to the desired cross-section of the channel. Earthfills shall be free from lenses, pockets, streaks or layers of material differing in texture. No filling shall be commenced without the permission of the engineer-in-charge.

4.2 Brick Lining — Bricks required for brick work shall be according to the specifications laid in 3.6 and shall be soaked in clear water immediately before use for one hour or till the complete cessation of air bubbles, whichever is later. They shall be kept free from sand and silt. The bricks shall be laid in English bond with frogs upward.

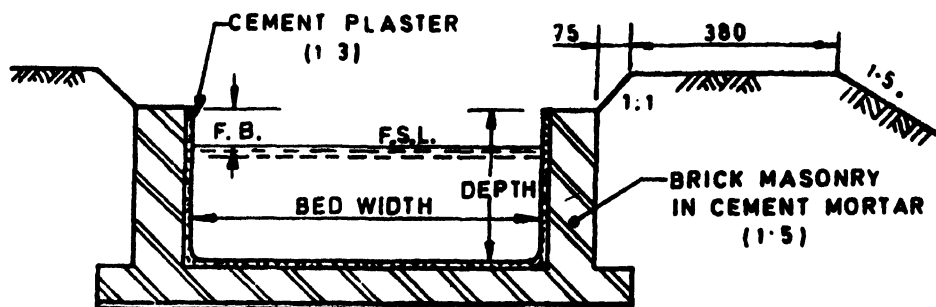
Half or cut bricks should be used only where required near the end of the walls (see Fig. 1).

4.2.1 Section of the Side Walls — The width of the side walls shall be 115 mm for height up to 450 mm (6 courses). For height of the side walls of 525 mm (7 courses), the first course shall be of one full brick, that is, 225 mm width and 75 mm height. The width of the remaining six courses of the side wall shall be 115 mm. For the height of side wall of 600 mm (8 courses), the first two courses shall be of full bricks, that is, the width will be 225 mm and the height will be 150 mm. The width of the remaining 6 courses will be 115 mm (see Fig. 2).

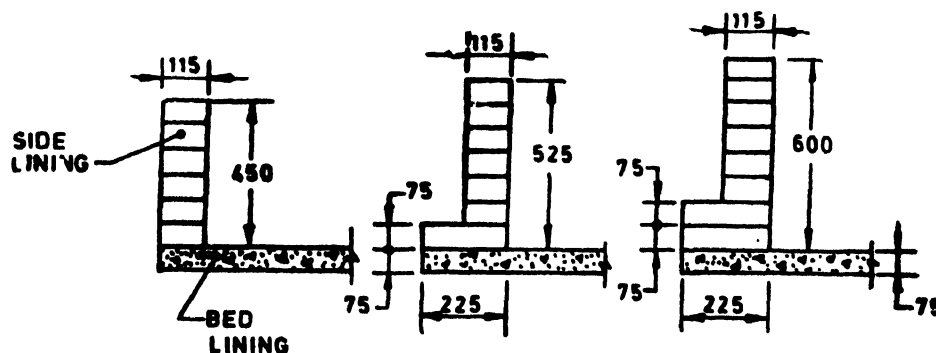
4.3 Composite Cement Concrete and Brick Masonry Lining — Following are the two methods for carrying out the lining work:

- a) A bed of 50 mm thick 1:3:6 cement concrete is laid over 100 microns LDPE film conforming to IS:9698-1980*. Side walls are constructed in brick masonry in 1:4 cement sand mortar (without plaster) or 1:5 cement sand mortar (with plaster). The inside and top of these vertical walls should be finished with 10 mm thick 1:3 cement sand plaster (see Fig. 3).
- b) Brick masonry in 1:5 cement sand mortar (with plaster) or 1:4 cement sand mortar

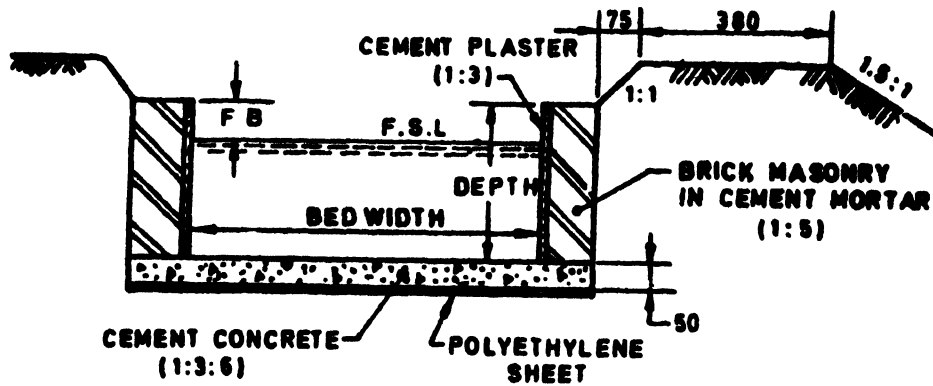
*Code of practice for lining of canals with low density polyethylene film.



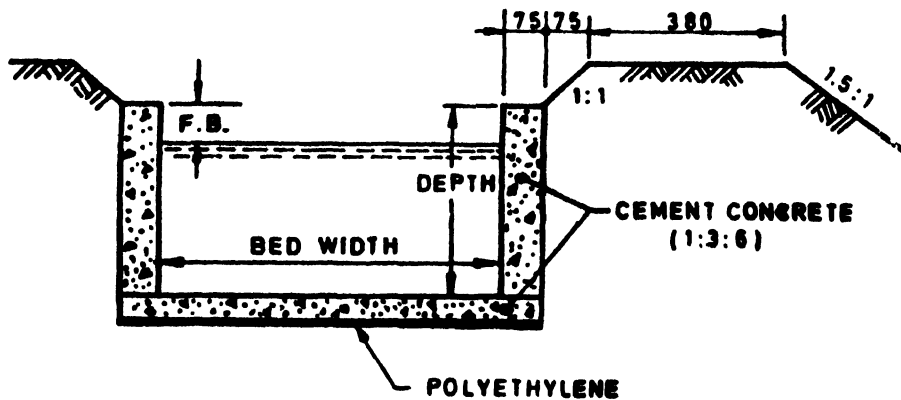
All dimensions in millimetres.
FIG. 1 TYPICAL BRICK MASONRY SECTION



All dimensions in millimetres.
FIG. 2 TYPICAL SECTION OF SIDE WALLS



All dimensions in millimetres.
FIG. 3 TYPICAL CEMENT CONCRETE AND BRICK MASONRY SECTION



All dimensions in millimetres.
FIG. 4 TYPICAL CEMENT CONCRETE SECTION

(without plaster) on the sides and 5 cm thick 1 : 3 : 6 cement concrete in the bed should be laid over 1.5 to 2.0 cm thick subgrade of slate pieces/100 microns LDPE film.

4.4 Cement Concrete Lining — 50 mm thick 1 : 3 : 6 cement concrete should be laid in the bed over a 100 micron LDPE film. The vertical side walls should be constructed with 75 mm thick 1 : 3 : 6 cement concrete. In case LDPE film is not being used, 75 mm thick 1 : 3 : 6 cement concrete shall be laid (see Fig. 4).

4.5 Stone Slab/Stone Masonry Lining

4.5.1 Stone Masonry Lining — Stone shall be free from laminations, soft spots, etc. Stone masonry should be laid in 1 : 2 : 8 mortar (1 cement : 2 lime : 8 stone dust) or 1 : 5 (1 cement : 5 sand mortar). The joints should be raked and pointed with 1 : 3 cement (see Fig. 5).

4.5.2 Stone Slab Lining — Stone slab used for the bed shall have thickness of 25 mm. Stone slab should be laid in 1 : 2 : 8 mortar (1 cement : 2 lime : 8 stone dust) or 1 : 5 (1 cement : 5 sand mortar). All the joints shall be raked and pointed. Masonry on the sides shall be laid in 1 : 2 : 8 cement lime/1 : 4 cement sand mortar. The remaining courses of side walls may be laid in 1 : 4 cement sand mortar.

4.6 Pre-Cast Cement Concrete Lining — It shall be in accordance with IS : 10646-1983*.

4.7 Strength Development — Strength development is an important requirement before masonry/ concrete is loaded to the full extent. The rate of construction shall synchronize with the development of strength, particularly in weak mixes. Extreme care shall be taken by putting the earth work behind the lining. Initially about 50 percent of the quantity of earthwork or up to 75 percent of the height shall be done. After a couple of runs of water in the lined water-course, the remaining earthwork may be completed and dressed.

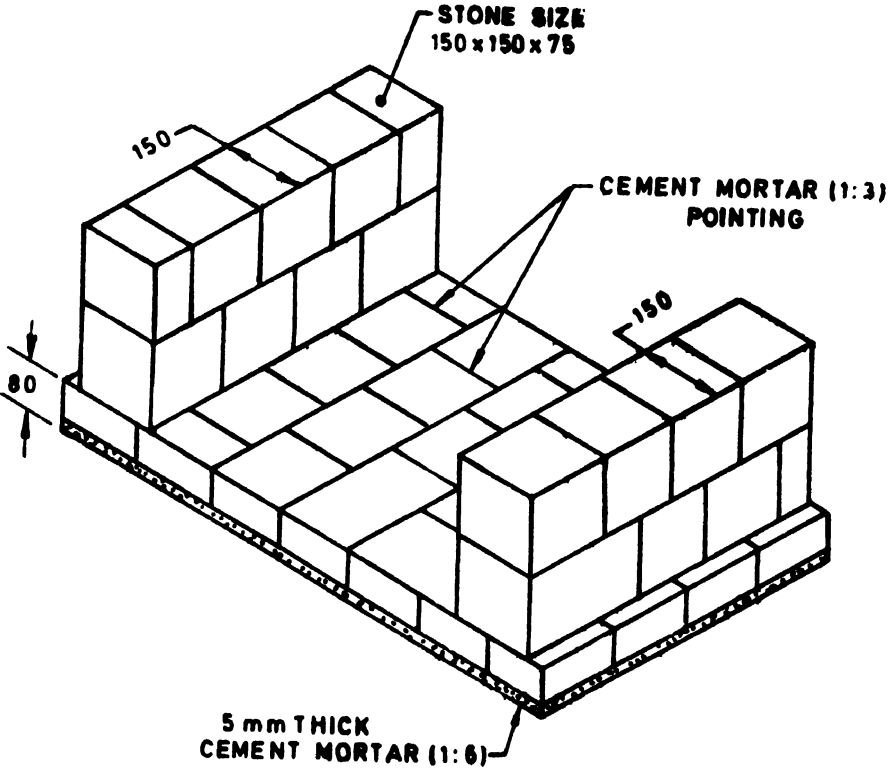
5. TESTING

5.1 The lining work constructed as explained in 4 shall be tested for leakage by filling the lined portion with available water. The points where some leakage is indicated shall be marked. These shall then be treated by raking and filling the joints on both sides of the side lining properly, wherever possible.

6. TURN-OUT FOR NAKKA

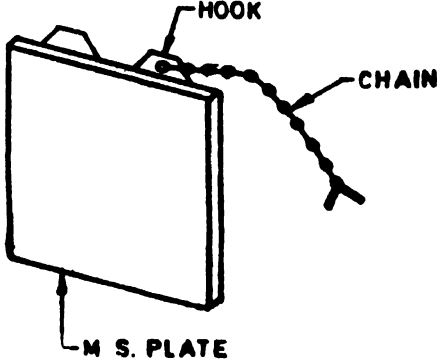
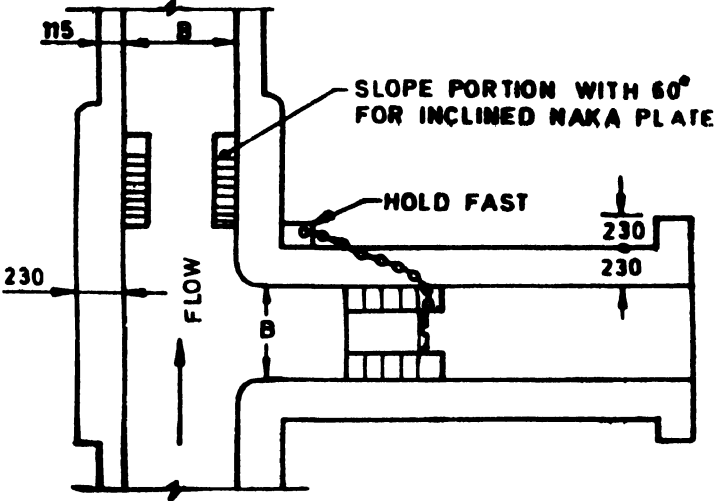
6.1 It is a structure capable of diverting the

*Specification for compressed precast cement concrete lines for canal linings.



All dimensions in millimetres.

FIG. 5 STONE MASONRY LINING



All dimensions in millimetres.

FIG. 6 TYPICAL DESIGN OF M.S. PLATE *Nakka* STRUCTURE

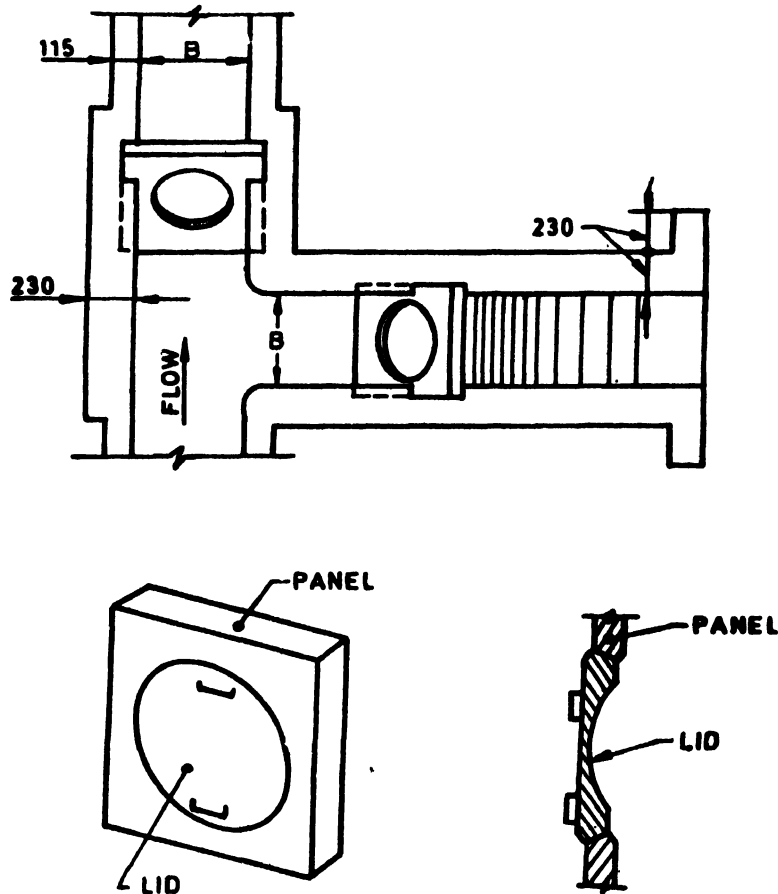
entire stream of water from the water-course to the *chaks* or from the field channels. These channels shall be strong because the farmers have tendency to dig and use earth around this structure to control leakage at gate point and thus unknowingly weaken the structure.

6.2 Following are the two most common types of *nakka* plates:

a) *Steel Nakka* — Steel *nakka* plate is provided with handles (one or two depending on the size) and a chain with angle piece at the end having split sick which is embedded

into the masonry of the *nakka* structure so as to avoid pilferage. The steel *nakka* is fixed at an angle of 60°. A typical steel *nakka* is shown in Fig. 6.

b) *Circular Nakka* — It consists of a panel and a lid. The panel is fixed into the masonry of *nakka* structure at an angle of 60°. The lid is fixed into the panel after a couple of rotary motions. This is a water tight arrangement and practically no earth is required to control the seepage. A typical circular *nakka* is shown in Fig. 7.



PRECAST PANEL AND LID

All dimensions in millimetres.

FIG. 7 TYPICAL DESIGN OF CIRCULAR *Nakka* STRUCTURE

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards Monthly Additions'.

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha
(Common to all offices)

Regional Offices :

Telephone

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg
NEW DELHI 110002

{ 331 01 31
331 13 75

Eastern : 1/14 C. I.T. Scheme VII M, V. I. P. Road, Maniktola
CALCUTTA 700054

{ 37 84 99, 37 85 61
37 86 26, 37 86 62

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022

{ 60 38 43
60 20 25

Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113

{ 235 02 16, 235 04 42
235 15 19, 235 23 15

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)
BOMBAY 400093

{ 632 92 95, 632 78 58
632 78 91, 632 78 92

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR.
COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD.
JAIPUR. KANPUR. LUCKNOW. PATNA. THIRUVANANTHAPURAM.